is examined and the results are applied to the emission from the Crab pulsar.

In the conventional analysis of synchrotron radiation one assumes that the pitch angle Ψ is large relative to the inverse of the normalized energy $\Upsilon = E/mc^2$; however, this assumption may be too restrictive for the understanding of synchrotron radiation from pulsars. This paper, therefore, considers the radiation from individual particles and ensembles of particles which have very small pitch angles.

For a single particle which has $\Upsilon\Psi \ll 1$ the spectral emissivity (erg/sec-Hz) is a maximum at frequency $\nu_m = 2\Upsilon\nu_B$ where ν_B is the gyrofrequency. The emissivity decreases approximately linearly below ν_m and is zero for higher frequencies. At ν_m the radiation is circularly polarized; it is linearly polarized at $\nu_m/2$; and it exhibits strong circular polarization (in the opposite sense from that at higher frequencies) for frequencies below $\sim \nu_m/5$.

The emissivity and polarization were calculated for truncated power law distributions of the form $N \propto \Upsilon^{-s}\Psi\exp(-\Psi^2/\tilde{\Psi}^2)$ for $\Upsilon_{min} < \Upsilon < \Upsilon_{max}$ and $N = 0$ otherwise. In the frequency range $2\Upsilon_{min}\nu_B \ll \nu \ll 2\Upsilon_{max}\nu_B$ the emissivity is proportional to ν^{2-s} and the degrees of linear and circular polarization are given by $\rho_\ell = 2(s-1)/(s^2-s+2)$ and $|\rho_c| = (s-2)(s+1)/(s^2-s+2)$ respectively. Below $2\Upsilon_{min}\nu_B$ the emission decreases linearly and has a high degree of circular polarization. A good fit to the spectral observation from NP 0532 from the infrared to the x-rays can be obtained with an electron distribution of the type considered above with $B = 10^5$ gauss, $s = 2.5$, $\Upsilon_{min} = 2 \times 10^3$, $\Upsilon_{max} = 10^8$, and $\tilde{\Psi} = 10^{-9}$. The validity of this model can be tested by measurements of circular polarization at optical and infrared frequencies.

23.03.11 Rocket Infrared Observations of the Galactic Center Region. M.O. HARWIT*, J.R. HOUCK, J.L. PIPHER, B.T. SOIFER, C.R.S.R., Cornell Univ. and Kitt Peak Natl. Obs. - Observations of the Sagittarius region in the wavelength ranges 5-6μ, 12-14μ, 16-23μ and 70-130μ were made with a helium cooled telescope carried to 190 km by an Aerobee rocket. The galactic center, and several new sources were observed and fluxes from each are reported.

*Visiting astronomer at Kitt Peak National Observatory which is operated by the Association of Universities for Research in Astronomy Inc. under contract with the National Science Foundation.

23.05.07 Ammonia: Detection of Inversion Radiation From Non-Metastable States and New Galactic Sources. M. Morris, Univ. of Chicago, B. Zuckerman, Cal. Inst. of Tech., and U. of Maryland, B. E. Turner, Nat'l Radio Astr. Obs., Patrick Palmer, Univ. of Chicago. Inversion radiation from NH_3 has been observed in several galactic sources including W3-(OH), W51, W43, DR21-(OH), Orion A, clouds in the galactic center region, and possibily Cloud 4, a dense dust cloud. In addition, significant radiation from the non-metastable (2,1) and (3,2) inversion levels has been detected in Sgr B2. With upper limits for the $N^{15}H_3$ (1,1) and (3,3) lines in this region, upper limits of 8 and 4 have been assigned to the optical depths. This combined with the presence of the non-metastable lines suggests that the core of the Sgr B2 cloud has hydrogen molecule densities $>10^7$ cm^{-3}. A map of the (2,1) radiation indicated that the angular size of the emitting region is $<5'.3$, the telescope beam-width, and thus much smaller than the entire NH_3 cloud. The observations were carried out with the 36 foot telescope of the National Radio Astronomy Observatory. (The National Radio Astronomy Observatory is operated by Associated Universities, Inc. under contract with the National Science Foundation.) Partial financial support for this work came from NSF Grants GP 24779 to the U. of Chicago, GP 25225 to California Institute of Technology, GP26218 to the U. Of Maryland, and from the Alfred P. Sloan Foundation.

23.06.07 Detection of the 1_{11}-1_{10} Transition of Interstellar formamide Patrick Palmer, U. of Chicago, C. A. Gottlieb, Harvard College Obs., Lee J Rickard, U. of Chicago, and B. Zuckerman, U. of Maryland. We have observed the 1_{11}-1_{10} transition of formamide (NH_2CHO) in emission in the direction of Sgr A and Sgr B2 at 1540 MHz. The observations were made with the 140 foot telescope of the National Radio Astronomy Observatory (The National Radio Astronomy Observatory is operated by Associated Universities Inc., under contract with the National Science foundation.) Laboratory measurements of the rest frequencies of the hyperfine components were carried out to assist in planning the observations and in analysis of the data. The present observations will be compared with those of Rubin, Swenson, Flygare, Benson and Tiglaar for the 2_{11}-2_{12} Transition of (NH_2CHO). Partial financial comes from NSF Grants GP 24779 to the U. Of Chicago, GP 19717 to Harvard University, and GP 26218 to the University of Maryland, and from the Alfred P. Sloan Foundation.

23.07.09 Brightness and Polarization Structure of Four Supernova Remnants at 2·8 Centimeter Wavelength. M.R. KUNDU and T. VELUSAMY, Astronomy Program, University of Maryland - The distribution of brightness and polarization of four supernova remnants, W 44, W28, IC 443, and 3C58 have been measured at 2·8 cm wavelength, using the NRAO 140 ft. telescope which has a pencil beam of 3' arc at this wavelength. The distribution of polarization in W 44 is fairly uniform over the most intense part of the source; the degree of polarization exceeds values as high as 20% with a position angle of about 40°. These values of the degree of polarization and position angle are consistent with the results obtained at 6 cm wavelength although at 6 cm there is significant Faraday rotation (10°-30°) which varies over different parts of the peak. Both the degree of polarization as well as the position angle vary over different parts of the source W 28. The degree of polarization varies from about 5% to 15%. The distribution of polarization over IC 443 also varies, the degree of polarization over the intense northeast peak of the source being about 9% at a position angle of about 10°. In this region there is a bright optical nebulosity which possibly causes considerable depolarization, with the result that at 6 cm we observe only about 1% polarization. The distribution of polarization over 3C58 is fairly uniform over the entire source, the degree of polarization being about 6% at a position angle of about 0°. These values are in agreement with the intrinsic values of degree of polarization and position angle derived by Weiler & Seielstad (Ap.J. 163, 455, 1971) from measurements at 10 and 21 cm wavelengths. Comparison of the 2·8 cm maps of W 28 and IC 443 with the optical pictures of the regions show many interesting similarities.